

## NEW JERSEY

2000-2001

Guidelines and  
Application**BEST  
PRACTICES****Deadline for Application to County Office:  
NOVEMBER 27, 2000**

The Best Practices application is a public document. The information that you provide will serve as the official record. Review the application prior to submission to ensure accuracy and adherence to the guidelines. Type or keyboard information requested on this page and page 2, if applicable.

Category Mathematics (Application is limited to one category. See page 3 for details.)  
Practice Name Math in a Japanese Garden  
Number of Schools with Practice one (If more than one school or district, read and complete information on page 2.)

County	Sussex
District (Proper Name)	Hampton Township School District
Address	One School Road Street/P. O. Box Newton, NJ 07860 City Zip Code
Telephone	973-383-5300 Fax 973-383-3835 Email burns@mcKeown.org
Chief School Administrator	Everett C. Burns
Nominated School #1 (Proper Name)	Marian E. McKeown Elementary School
Address	One School Road Street/P. O. Box City Newton, NJ 07860 Zip Code
Telephone	973-383-5300 Fax 973-383-3835 Email
Principal	Mary Ann Boyd
Program Developer(s)	Carol Tremper
Application Prepared By	Everett C. Burns/Carol Tremper
Chief School Administrator's or Charter School Lead Person's Signature	<i>Everett C. Burns</i>

**FOR USE BY COUNTY SUPERINTENDENT OF SCHOOLS ONLY**Approved: ☒ Yes ☐ No County Superintendent's Signature*Benny Anderson*

**NEW JERSEY  
BEST PRACTICES  
2000-2001 APPLICATION**

**Application Requirements: Failure to comply with the procedures for submission of the application will result in the elimination of the application.**

1. **RESPONSES** to the information and the statements below must be **ANONYMOUS** and **ACCURATE**. No reference should be made to the names of the district, the school(s) or community. Use the words "the school" or "the schools" in referring to the applicant in responding to the statements
2. **USE ONLY THE SPACE PROVIDED ON THE APPLICATION FORM** on pages 1, 2 (if applicable), and 4. Do not include any additional materials, as they will not be reviewed in the selection process.
3. Application must be **keybarded on 8 1/2" x 11" white paper, portrait format. Twelve-point or larger computer font or fourteen-pitch or larger typewritten font must be used.** (This sentence is in twelve-point Times New Roman.)
4. **KEYBOARDED RESPONSES** to all the statements below must be **no more than a total of four pages**. Keyboard and number the statement followed by the response. Format your response for accuracy and clarity.
5. The information on page 4 and the responses to statements must be copied on one side of the page. The information on pages 1 and 2 (if applicable) must be copied on one side of the page. Staple pages 1, 2 (if applicable), 4, and the keyboarded responses together, in that same order.
6. The original application must be signed by the district chief school administrator or charter school lead person, indicating his/her approval.
7. The original and seven copies of the application must be submitted to the county superintendent of schools by **November 27, 2000**, with the **Itemized List of District Applications** form. Keep the seven copies of each application together with the original containing the signature of the district chief school administrator or charter school lead person on the top of each set.

The following data is required to assist the panelists in the evaluation of the application:		
<b>Type of School</b>	<b>Grade Levels</b>	<b>Practice Name</b> <u>Math in a Japanese Garden</u>
<input checked="" type="checkbox"/> Elementary School	<u>K-6</u>	Number of Schools with Practice <u>One</u>
<input type="checkbox"/> Middle School	<input type="checkbox"/>	Number of Districts with Practice <u>One</u>
<input type="checkbox"/> Junior High School	<input type="checkbox"/>	Location <input type="checkbox"/> Urban/City <input type="checkbox"/> Suburban With Urban Characteristics
<input type="checkbox"/> High School	<input type="checkbox"/>	<input type="checkbox"/> Suburban <input type="checkbox"/> Small City/Town <input checked="" type="checkbox"/> Rural
<input type="checkbox"/> Other: _____	<input type="checkbox"/>	

Check the ONE CATEGORY into which the practice best fits.		
<input type="checkbox"/> Arts (Visual and Performing Arts)	<input type="checkbox"/> Educational Technology	<input type="checkbox"/> Safe Learning Environment
<input type="checkbox"/> Assessment/Evaluation	<input type="checkbox"/> Gifted and Talented Programs	<input type="checkbox"/> School-to-Careers/Workplace Readiness
<input type="checkbox"/> Bilingual Education and Diversity	<input type="checkbox"/> Health and Physical Education	<input type="checkbox"/> Science
<input type="checkbox"/> Citizenship/Character Education	<input type="checkbox"/> Language Arts Literacy	<input type="checkbox"/> Social Studies
<input type="checkbox"/> Early Childhood Education Programs	<input checked="" type="checkbox"/> Mathematics	<input type="checkbox"/> Special Education
<input type="checkbox"/> Educational Support/Guidance and Counseling Programs	<input type="checkbox"/> Professional Development	<input type="checkbox"/> World Languages
	<input type="checkbox"/> Public Engagement	
	(family involvement and partnerships with business, community, school districts, and/or higher education)	

1. Describe the practice proposed for recognition, and list its objectives. Detail how the practice is innovative and how it promotes high student achievement.
2. List the specific *Core Curriculum Content Standards*, including the *Cross-Content Workplace Readiness Standards*,\* addressed by the practice and describe how the practice addresses those standard(s). Provide an example to substantiate your response.
3. Describe the educational needs of students that the practice addresses. Document the assessment measures used to determine the extent to which the objectives of the practice have been met. Provide assessments and data to show how the practice met these needs.
4. Describe how you would replicate the practice in another school and/or district.

\*The 1996 edition of the *Core Curriculum Content Standards* published by the New Jersey State Department of Education was disseminated to all districts and charter schools and is available on line through the department's web site at <http://www.state.nj.us/education>.  
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1. Describe the practice proposed for recognition and list its objectives.

Detail how the practice is innovative and how it promotes high student achievement.

• Practice: “Math in a Japanese Garden”, a mathematics class project, focuses on the design and construction of a Japanese-style garden at the school. It incorporates high level thinking, fine arts, creativity, science, and social studies, while eliciting public engagement through family, alumni, business and municipal involvement.

• Objectives:

1. Students design a Japanese-style garden, with a small pond, to be constructed at the school.
2. The design process enables students to experience multidisciplinary classroom extensions combining math, art/aesthetics, science, social studies and creativity.
3. Motivation includes a contest. A selected design will be built and its designers recognized.
4. The garden becomes a low-maintenance asset supporting the arts, science, and math learning.

• Innovation: Japanese garden design involves geometry, measuring and calculating skills through abstract and fine arts concepts such as aesthetics, positive and negative space, balance and harmony. Mathematical concepts of asymmetry, odd numbers, and parallel and concentric lines are expressed in an ancient cultural form which is highly accessible today, and popular in the U.S.

An introduction to Japan and its culture links mathematics to social studies, and in selecting, calculating and planning for construction materials, to careers and economics. Plant and pond maintenance supports meaningful science. Students will research and desktop publish informational cards, laminate them, and place them in a permanent receptacle as a future reference.

Hands-on mathematics through scale model-making is highly motivating. Transfer from graph paper to three-d proves a challenging process. Students experience Bloom’s Taxonomy of Cognitive Domain, from knowledge to evaluation. Designs show many different but appropriate responses to a common stimulus. The useful project transmogrifies a dull courtyard into a delight.

• High Student Achievement: During this project, all sixth graders were motivated and positively involved. The caliber of achievement was inspiring to teacher and student. Basic skills students were enthusiastic and some produced models of superior quality. A display in the media center of completed models attracted interest from all ages, child to adult. Each sixth grade class set criteria for its openended project, and students experienced evaluating their products using the criteria.

2. List specific Core Curriculum Content Standards, including the Cross-Content Workplace Readiness Standards, addressed by the practice and describe how the practice addresses those standard(s). Provide an example to substantiate your response.

*Core Curriculum Content Standards*

• 4.1 All students will develop the ability to pose and solve mathematical problems in mathematics, other disciplines, and everyday experiences. Students must measure an existing space and calculate areas. To specify materials to be ordered they calculate volume and costs of

self-selected materials for the design, based on actual samples of stones at current prices.

• 4.2 All students will communicate mathematically through written, oral, symbolic, and visual forms of expression. Students decide on the scale to be used, produce on graph paper an accurate scale drawing of the courtyard area, label fixed elements, produce accurate scale drawings of a design proposal, including symbols to represent required elements, and make either a three-dimensional model of an individual or consensus design or a top quality drawing to scale. Students may provide a legend or key. Students orally propose criteria for an evaluation matrix and reach consensus on the final criteria for their particular class. They evaluate their projects.

• 4.3 All students will connect mathematics to other learning by understanding the interrelationships of mathematical ideas and the roles that mathematics and mathematical modeling play in other disciplines and in life. The Japanese aesthetic for dry gardens, simplified, requires the following mathematical elements: *Asymmetry* is basic for all design elements. Boulders are required to be in *odd numbers* in each of the odd number of groupings. *Positive and negative spaces* (boulders set in raked gravel) are strong components of the *balance* of a Zen or dry garden. Positive elements can include plants, water, bridges, and fences. *Geometry*: Parallel and concentric lines of raked gravel form patterns. *Perspective*: In the most pure example of a dry Zen garden, Ryoan-ji in Kyoto, there are 15 boulders, though all 15 are not visible from any one angle. “Only Buddha can see all 15.” *Tessellations*: A path of stones or water splash tiles can tile a plane. *Scale*: A Japanese garden represents the world in a microcosm. Boulders represent islands or mountains while raked gravel or sand represents the water around them. *Modeling & Dimensions*: Students observe the relationship between the full scale courtyard and the scale drawings and models.

4.4 All students will develop reasoning ability and will become self-reliant, independent mathematical thinkers. All students had to plan workable elements within a limited volume.

4.7 All students will develop spatial sense and an ability to use geometric properties and relationships to solve problems in mathematics and everyday life. Operating in a spatial sense is the soul of this project, and the selection of and calculations for materials relate to every day life.

4.9 All students will develop an understanding of and will use measurement to describe and analyze phenomena. Measurement is basic to this project. In addition, specially constructed wooden rakes demonstrate how depth, angles, and positioning of cuts affects gravel patterns.

4.11 All students will develop an understanding of patterns, relationships, and functions and will use them to represent and explain real-world phenomena. 1. The Japanese garden is the spatial expression of a relationship of symbols and patterns. 2. The scale models or drawings relate to a real construction project to be made at the school as a legacy of their work. 3. Rakes (as above)

4.16 All students will demonstrate high levels of mathematical thought through experiences which extend beyond traditional computation, algebra, and geometry. Synthesis, evaluation, and symbolic, scale representations of real space are linked to the aesthetics of an ancient culture.

### *Cross-Content Workplace Readiness Standards*

All workplace readiness standards are addressed as follows:

1. *Careers:* Architects, landscape designers and construction firms use model making, measurement and scale drawing skills. Gardeners and nursery workers plan and create displays.
2. Students used *information* from another culture to develop designs for an specific space.
3. *Critical thinking, decision-making, and problem-solving skills* saturate this project.
4. *Self-management:* Students used task sheets to sequence tasks, and evaluated their projects.
5. *Safety Principles:* Students safely used tools, including Exacto knives, in this project.

3. Describe the educational needs of the students that the practice addresses.

Document the assessment measures used to determine the extent to which the objectives of the practice have been met.

Provide assessments and data to show how the practice met these needs.

Needs: Students need to learn and apply the many inter-disciplinary skills itemized above.

Objectives Met: Photographs documented the transformation of the vacant courtyard to a Japanese garden with pool. Itemized checklists tracked design and project objectives after lessons linked aesthetics to practice. A student task sheet detailed each step in the process, from measurement through evaluation of the finished product, complete with columns of details and check-off boxes. One can replicate the self-management checklist and evaluation matrix as follows:

**Student checklist tracks process to product.** (Text follows:)

1. On **graph paper** make a **scale drawing of the courtyard** showing measurements for the following: a. Whole courtyard— length (green stake to far wall) and width; b. Concrete patio, length & width; c. Drainage hole, in proper scale and approximate location; d. Tree, as circle.
  2. **Design a draft layout** for the most interesting possible Japanese garden using the elements listed below: a. Asymmetrical design where elements are balanced (Use positive & negative space.); b. Raked sand or gravel pattern; c. Odd numbers of large rocks arranged in groups (moss and/or plants optional); d. Path; e. Dry riverbed; f. Arched bridge over dry riverbed; g. Pond (with optional waterfall); h. Only a few decorative evergreens; i. Tree; j. Optional lantern
  3. **Final product** = a finished, carefully crafted **scale model** layout of a Japanese garden including elements a-i (j is optional) from #2, the draft layout. The product may be **one** of the following: a. **3-dimensional scale model** created in a shallow box or tray, glued rocks, other areas shown by paper, material, balsa wood, and/or clay, etc.) b. **2-dimensional** (paper) carefully crafted **scale drawing** , as seen from above (a bird's eye view), which will use color, and texture. You may use collage techniques and glue layers, or you may draw the layout. (Include a key to show scale + names, & date.) (Note: #3 may be done with a partner.)
- **Tracking progress:** The teacher keeps a class checklist and checks off each student as the individual tasks are completed. Each student is responsible for tracking his or her own progress by means of the chart, but also must check in with the teacher upon completion of each step.
- Self- & Teacher Evaluation of Individual Designs:** In each math class, students develop criteria for

a matrix evaluation, printed out in a side-by-side duplicate format for both self- and teacher-evaluation based on that class's criteria. Each grade is average of both student and teacher points. *The text-only portion of each class's student-developed (100-point ) criteria matrix follows:*

**9:30 a.m. class:** 1. 45 pts. Made a garden design (model or drawing) showing elements a– i

2. 25 pts. Creativity: Originality shown. Didn't copy.
3. 10 pts. Neatness
4. 10 pts. Shows balance.
5. 10 pts Scale model or drawing shows accurate placement.

**10:15 class** 1. 10 pts. Created an asymmetrical and balanced design.

2. 20 pts. Creativity: Used different types of Japanese elements in own way (not copied).
3. 30 pts. Used elements "a" to "i" (and maybe "j") from part 2 of task sheet.
4. 40 pts. Part 3, the garden design, is neatly, carefully done.

**1:15 class** 1. 10 pts. Neatness

2. 20 pts. To scale (correct measurements)
3. 30 pts. Used allowed or correct materials
4. 40 pts. Showed elements "a" to "i" (and maybe "j") from part 2 of task sheet.

**Basic Skills Math Class** 1. 40 pts. Followed directions. Made a garden design (model or drawing) that shows elements a - i, from part 2 of task sheet.

2. 20 pts. Originality (Design is unlike any other design.)
3. 20 pts. Neatness
4. 20 pts. Creativity

Selection of Design The selection of the garden design to be constructed was based on teacher's subjective criteria which included fire drill egress through the courtyard via an aesthetically pleasing walkway, expression of the required Japanese elements, feasibility of construction, and relative juxtaposition of garden elements vis á vis visibility from glassed-in hall.

Sustained Learning Garden use can continually be documented through publicity and photographs of activities by school and community. Maintenance of pool, plants, and raking of gravel can be tracked by sign-in or a log-in system, as well as photographs of students at work.

4. Describe how you would replicate the practice in another school and/or district.

Many schools have uninspiring courtyards, areas within parking lots, or side areas. These gardens do not have to be large to be effective; they are frequently used in small spaces. Our district spent very little on this garden, to date, because we have received volunteer labor and machines, donated materials, and plants. Students are eager to help in as many phases of the finishing process as possible. This mathematical application invites community cooperation and creates a lasting aesthetic delight, inspiring as an outdoor classroom, and for time out from the frenetic pace of the playground. This large or small scale project links beauty and learning in an oasis of calm.